



**TVA Standard
Programs and
Processes**

TITLE

**Resource Efficient Building Design
Process**

TVA-SPP-3.3

Rev. 0000

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Effective Date TBD

Responsible Peer Team: Facilities Management Internal Energy Management Program

Concurred by: _____
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Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
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1.0 PURPOSE

To provide a method for Business Units to comply with federal laws and regulations including the National Energy Conservation Policy Act (NECPA), Energy Policy Act of 2005 (EPAct05), “Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding” (Sustainable MOU) through the incorporation of energy efficient, water efficient, and sustainable retrofits to existing space and the design of new spaces and buildings within TVA. To reduce energy and potable water usage to a minimum and promote sustainable building design as related to energy. These methods are to be implemented when they do not adversely affect TVA and its mission, and where they are life-cycle cost effective.

2.0 SCOPE

The SPP applies to all TVA owned or leased buildings in whole or in part that use energy, potable water, and/or building material resources and the TVA or contract employees involved in the design, procurement, construction, operations, or maintenance of those facilities. This SPP does not apply to those buildings where the energy use is included in the lease and/or the buildings are used to generate or transmit electricity.

3.0 PROCESS

3.1 Roles and Responsibilities

Building owner designated representative – upon receiving a request or identifying a need for additional employee or unoccupied space, determines if existing spaces can be modified to meet the requirements or whether leased space or new construction may be required. The representative determines if the space or structure will require and/or consume potable water or energy so conservation initiatives can be applied.

Project Management and Design Professionals – incorporate energy efficient, water efficient and sustainable design principles into the project design process. They incorporate cost effective Energy Conservation Opportunities (ECOs) and/or Best Management Practices (BMPs) for water conservation into renovation and new construction projects. They also specify materials for procurement and installation that support the TVA sustainable and energy/water initiatives.

Operations & Maintenance Support Staff – conducts maintenance and modification activities in a manner that extends and optimizes the life-cycle of existing materials and equipment, and applies energy/water conservation practices into daily operations. They specify recurring replacement parts and consumables and support the sustainable/conservation efforts where applicable.

Agency Energy Management Committee (AEMC) – provides oversight and guidance on TVA’s sustainable and energy/water management programs. Collects data as required and submits annual reports for the agency. Conducts periodic energy and water surveys on existing buildings and provides findings and recommendations to the architects, designers, project managers and those applying operation and maintenance (O&M) strategies. Advises architects and designers on choosing an existing space or building for modifications and provides sustainable renovation and new construction guidance. Helps identify and incorporate minimum sustainable standards and optional sustainable concepts where applicable.

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3.2 Energy Survey Process

3.2.1 Minimizing Energy Use at Existing Facilities

Energy surveys shall be conducted on 10% of TVA owned or leased facilities each year to identify energy efficient improvements. The Energy Conservation Opportunities (ECOs) identified during the surveys are evaluated by the AEMC to determine which will pay for themselves in ten years or less and which are not cost effective to implement. See Appendix A for a step by step energy survey process.

Cost effective ECOs shall be submitted during business/budget planning cycles for funding and implementation. Those not implemented prior to the next periodic survey of a facility should be carried forward and reevaluated. Energy use at all TVA facilities shall be tracked by utility bills or estimated if meters are not present.

Existing facilities which are renovated are required to meet minimum energy consumption standards by incorporating cost effective energy-saving technologies listed in the "TVA Sustainable Check List." In addition to constantly seeking consumption reduction strategies at existing facilities, SBUs shall use renewable energy sources by installing solar energy systems where applicable.

3.2.2 Incorporating Energy Efficiency into New Facilities

All new facilities should incorporate energy-saving technologies and include one or more renewable energy technologies into the design where feasible and when cost-effective (see "TVA Sustainable Check List"). In addition all new facilities shall be designed to meet the Federal Energy Code 10 CFR Parts 434 and 435.

Since each new facility should be designed to be as energy efficient as possible additional money shall be allotted in project budgets to fund cost effective energy, water and sustainable improvements prior to design. ECOs shall be identified and evaluated by the AEMC during the design planning process. Those deemed as feasible and cost-effective shall be incorporated into the design and implemented during construction by the building owner designated representative.

All implemented ECOs must be reported and documented. Once a new facility is five years old it will be considered an existing facility and subject to the 10% survey requirement.

3.2.3 Energy Management Goals and Reporting

Each year progress toward meeting energy-saving goals will be reported to Federal Energy Management Program (FEMP)/Department of Energy (DOE) and the Office of Management & Budget (OMB). The AEMC will coordinate the collection of data and survey results on a semi-annual basis and prepare/submit the report annually.

1. The primary goals are, where feasible and cost-effective to:
 - a. reduce energy consumption per gross square foot of TVA standard facilities 35 percent by 2010, based on 1985 benchmarks.

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3.2.3 Energy Management Goals and Reporting (continued)

- b. reduce energy consumption of TVA industrial facilities 25 percent by 2010, based on 1990 benchmarks.
 - c. reduce energy consumption of TVA standard and industrial facilities 2 percent each year from FY 2006 through FY 2015, based on 2003 benchmarks.
 - d. support an all-inclusive federal goal of installing at least 20,000 solar energy systems by 2010.
 - e. support implementation of requirements outlined in the “Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding” (Sustainable MOU) signed by TVA in March 2006.
2. The required reports include:
- a. number and square feet of facilities surveyed that do not use energy and/or potable water
 - b. number and square feet of facilities surveyed that do use energy and/or potable water
 - c. number and square feet of facilities surveyed that are dominated by process energy (industrial/laboratory buildings)
 - d. number and square feet of facilities surveyed that are used to generate and transmit electricity or are connected to such facilities (excluded buildings)
 - e. number and energy savings of potential ECOs
 - f. number of existing facilities and ECOs implemented
 - g. number of new facilities and ECOs implemented
 - h. number of non-cost effective ECOs

3.3 Water Survey Process

3.3.1 Water Conservation Practices

All non-excluded TVA owned or leased facilities shall meet minimum potable water consumption standards. The Federal Energy Management Program (FEMP) recommends ten conservation technologies and techniques as Water Conservation Best Management Practices (BMPs) for agencies to adopt and use for that purpose. They include:

- a. Practice 1 - Public Information and Education Programs
- b. Practice 2 - Distribution System Audits, Leak Detection and Repair
- c. Practice 3 - Water Efficient Landscaping

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3.3.1 Water Conservation Practices (continued)

- d. Practice 4 - Toilets and Urinals
- e. Practice 5 - Faucets and Shower heads
- f. Practice 6 - Boiler/Steam Systems
- g. Practice 7 - Single-pass Cooling Systems
- h. Practice 8 - Cooling Tower Systems
- i. Practice 9 - Miscellaneous High Water Using Processes
- j. Practice 10 - Water Reuse and Recycling, including Gray Water

3.3.2 Minimizing Water Use at Existing Facilities

Water audits should be conducted on TVA owned or leased facilities as needed through the IEMP in coordination with SBUs to identify water efficiency improvements. A listing of Water Conservation BMPs that are applicable to each facility are identified during the surveys and evaluated by the AEMC. Each BMP/water-saving measure is reviewed to determine which are cost effective to implement that will pay for themselves in ten years or less, and which are not. See [Appendix A](#) for a process flow chart.

Cost effective BMPs should be submitted during business/budget planning cycles for funding and implementation. Those not implemented prior to the next periodic survey of a facility should be carried forward and reevaluated.

Existing facilities being renovated should incorporate approved potable water-saving features into the design and construction plan. Applying BMP water consumption reduction strategies at existing facilities helps TVA designate more facilities as “water efficient facilities”, a statistic reported annually by the AEMC.

3.3.3 Incorporating Water Efficiency into New Facilities

All new facilities shall be designed to be as water efficient as possible. All BMPs shall be considered and if applicable to the design be evaluated for cost effectiveness and implementation by design professionals and the AEMC during the design planning process. Every new facility should be designed to incorporate four or more BMPs.

BMPs deemed as cost effective by the AEMC and identified within the original scope of the project, should be specified by design professionals and incorporated into the design and implemented during construction by the building owner designated representative when applicable.

All implemented BMPs shall be reported and documented. Any cost effective BMPs not implemented need to be reconsidered periodically for funding if they are still determined to be cost effective by the IEMT. Once a new facility is five years old it will be considered an existing facility and a new survey must be performed.

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3.3.4 Water Management Goals and Reporting

Each year progress toward meeting potable water conservation goals will be reported to FEMP/ DOE. The IEMT will coordinate the collection of data and survey results on a semi-annual basis and prepare/submit the report.

1. The primary goals are to:
 - a. survey and implement cost effective BMPs in 30 percent of TVA facilities by 2006
 - b. survey and implement cost effective BMPs in 50 percent of TVA facilities by 2008
 - c. survey and implement cost effective BMPs in 80 percent of TVA facilities by 2010
2. The required reports include:
 - a. number and square feet of facilities surveyed that use potable water
 - b. number and square feet of facilities surveyed that do not use potable water
 - c. number of existing facilities that incorporate one to three BMPs
 - d. number of existing facilities that incorporate four or more BMPs
 - e. new facilities that incorporate four or more BMPs
 - f. number of non-cost effective BMPs

3.4 Sustainable Space Process

3.4.1 Applying Sustainability to Space Needs

All non-excluded TVA owned or leased facilities shall meet minimum sustainable standards listed in the "TVA Sustainable Check List". In addition "optional" sustainable design concepts that exceed minimum standards shall be considered and implemented where possible during space renovations or new construction. See [Appendix A](#) flow chart for a step by step process.

3.4.2 Rearrange People - First Choice - Most Sustainable

When there is need for more space in TVA facilities, the most sustainable thing to do is to rearrange or relocate employees without any modifications to the existing constructed workspace. The building owner or designated representative should always maximize the use of existing space before considering space renovations or the construction of new space.

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3.4.3 Rearrange Furniture and Cubicles: Steps M1-M3

If space needs cannot be met by moving people or changing schedules the building owner or designated representative needs to determine if existing occupied space can be rearranged to meet the customer needs.

If existing space can be rearranged the building owner or designated representative shall implement the design project process. When laying out a new space take advantage of existing daylighting being careful to place people perpendicular to the window wall to eliminate glare. Also layout the space with future needs in mind to minimize future moves. When approved, the building owner or designated representative will hand off to Operations & Maintenance Support Staff to implement a M1-M3 move. Every effort should be made to “reduce, reuse and recycle.” Reduce to a minimum the movement of people, furniture and office cubicles. Reuse existing furniture and panels. Recycle or recondition existing furniture and panels before purchasing new. Recycle all packaging, plus salvage, sell, or donate surplus furniture and panels.

3.4.4 Renovate Existing Space or Building: Step M4

If space needs cannot be met by moving people, furniture, and cubicles, the building owner or designated representative need to determine if existing occupied space can be renovated.

If this is possible the building owner or designated representative should consult with the AEMC to help incorporate “minimum sustainable standards” and consider those optional sustainable concepts that go above and beyond the standard. When approved, the building owner or designated representative will hand off to operations maintenance support staff to implement a M4 renovation.

3.4.5 Renovate Existing New Space or Building: Step M5

If space needs cannot be met by renovating existing occupied space, the building owner or designated representative need to determine if space in an existing new building can be leased or bought to meet the customer needs. If existing space or a whole existing building can be obtained the building owner or designated representative shall implement the design project process and work with the AEMC to select an energy/water efficient and sustainable space or building.

3.4.6 Build a New Building - Last Choice - Least Sustainable

New construction is the least desirable option to meet space needs due to the materials required and energy involved. All new buildings shall be designed to be sustainable by incorporating the following:

- a. Location: An existing brown site (a site built on in the past that still has utility access) should be used if possible.
- b. Site selection and design: The site shall be suitable to accommodate the building design. Cutting and filling should be avoided and natural features such as existing trees should be preserved.

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3.4.6 Build a New Building - Last Choice - Least Sustainable (continued)

- c. Renewable energy design: The building shall be designed to take advantage of natural renewable energy sources such as the sun for passive solar heating and day-lighting and the wind for natural ventilation during spring and fall. Solar hot water heating and photovoltaic systems should be considered for initial installation or allowed for in future additions.
- d. Energy efficient design: The building shall be designed to meet an energy budget of 50,000 Btus/gsf or less. The design should include energy efficient HVAC and lighting systems with controls to minimize energy use.
- e. Water efficient design: The building design should include water saving fixtures and allow the immediate incorporation or future incorporation of rainwater and gray water collection and reuse on site when applicable.
- f. Landscape design: The building site shall be landscaped with low maintenance plants (or hardscape) which survive well in the building's climate without the use of artificial watering, fertilizer and pesticides. The parking should be designed to keep run-off on site through collection and reuse of water or the use of permeable paving.
- g. Future use design: The building should be designed with future uses in mind. Buildings that can easily be converted from office to retail, to even future housing, will prevent them from being torn down and replaced. The building should also be designed for ease of future expansion.
- h. Disposal: The building should be designed to be easily taken apart and its components recycled at the end of its life span.
- i. Sustainable material usage: The building should be designed to be built with materials that have sustainable qualities. Preferred building materials are those made by companies that have joined in the effort to preserve the environment and who are manufacturing materials in low or zero emission plants from recycled nontoxic components. The materials should be extremely durable and capable of being reprocessed into new materials at the end of their life.

Materials listed as having sustainable qualities or recommended by EPA should be used, and those produced locally using locally available components should be specified. Request that materials delivered to the site have minimum packaging or reusable packaging that can be returned to the manufacturer or be recycled.

3.4.7 Sustainable Goals and Reporting

Each year progress toward meeting sustainable goals will be reported to FEMP/ DOE. The AEMC will coordinate the data collection on a semi-annual basis and prepare/submit the report.

- 1. The primary goals are to:
 - a. incorporate minimum sustainable standards into buildings during renovation and new construction.

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3.4.7 Sustainable Goals and Reporting (continued)

- b. incorporate as many optional sustainable design concepts as possible into renovated and new buildings.
- 2. The required reports include:
 - a. number and square feet of facilities that meet minimum sustainable standards.
 - b. number and square feet of facilities that meet one or more optional sustainable design concepts.

4.0 RECORDS

4.1 QA Records

None

4.2 Non-QA Records

None

5.0 DEFINITIONS

AEMC – Agency Energy Management Committee

BMP – Best Management Practices for water conservation

DOE – Department of Energy

Energy Conservation Opportunity (ECO) – a potential change in methods or technology that results in energy savings when compared to existing consumption rates.

Energy – typically expressed in BTU's, it's the electricity, natural gas and/or fuel oil used to power and operate TVA's facilities.

Energy Policy Act of 1992 (EPAct92) – the goal of the act is to improve energy efficiency in the public and private sector, improve the availability of conventional fuel sources, and promote the use of future alternative fuel sources to power the nation's buildings, vehicles and industry.

Energy Policy Act of 2005 (EPAct05) – supplements and in many areas replaces and updates the requirements of the Energy Policy Act of 1992.

Energy Survey – the inspection of all energy-using systems in a facility such as the heating, cooling, hot water, fans, motors, lighting and equipment. It includes energy delivery and control devices such as transformers, thermostats, and other HVAC/electrical controls and sensors.

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5.0 DEFINITIONS (continued)

Energy Team – architects, engineers and assistants trained to identify and evaluate potential energy conservation opportunities (ECOs) and water best management practices (BMPs).

Environmentally Preferable – products and services that have less negative effect on health and the environment than standard products and services.

Executive Order 13101 (E.O. 13101) – in summary, directs federal agencies to use recycled content and environmentally preferred products, and to consider environmental factors such as waste prevention, recyclability, life cycle costs and disposal methods when developing plans, drawings, statements, and specifications for environmental-impacting activities.

Executive Order 13123 (E.O. 13123) – in summary, directs federal agencies to improve energy management in order to save taxpayer dollars and reduce emissions that contribute to air pollution and global climate change.

Executive Order 13221 (E.O. 13221) – in summary, directs federal agencies to purchase energy standby power devices to reduce consumption when equipment is not in use or in standby mode.

FEMP – Federal Energy Management Program

Gray Water – water which has been mildly contaminated with soap and soil. Typically water discharged from sinks, showers, bathtubs, and washing machines.

IEMP – Internal Energy Management Program

Life cycle cost-effective – the sum of the present values of investment, capital, installation, energy, operating, maintenance, disposal cost, and other costs for energy and water using products that are less than those for alternative energy/water using products or services.

OMB – Office of Management and Budget

Post Consumer Material – any material or product that has been used by the public and is ready to be discarded.

Potable Water – fresh, clean water which is safe for human consumption.

Recovered Material – any used material or product that has been diverted from disposal for the purpose of being reused at another building or location, or used to make another product.

Recyclability – the ability of a material or product to be taken apart and recycled into new materials or products.

Renewable Energy – energy produced by solar, water, geothermal and biomass.

Restorative – the act of improving environmental quality or offsetting a negative action with a more positive environmental action, such as planting a new forest to offset the negative effect of constructing a new building.

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5.0 DEFINITIONS (continued)

SBU – Strategic Business Unit.

Sustainability – meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable Architecture – designing and constructing buildings in a way that minimizes the negative impact on the environment.

Sustainable Building Materials – those materials whose creation, use and disposal does not damage the environment. A good sustainable building material is one that is manufactured locally with non-toxic recycled content using minimal amounts of natural resources that can be recycled or reused at the end of its life.

Sustainable Team – architects and engineers trained to retrofit existing buildings or design new buildings with technologies and materials that can minimize the buildings impact on the natural environment and conserve material and energy resources.

TVA Facilities – any building, collection of buildings, grounds, or structures in whole or in part that consume energy or water.

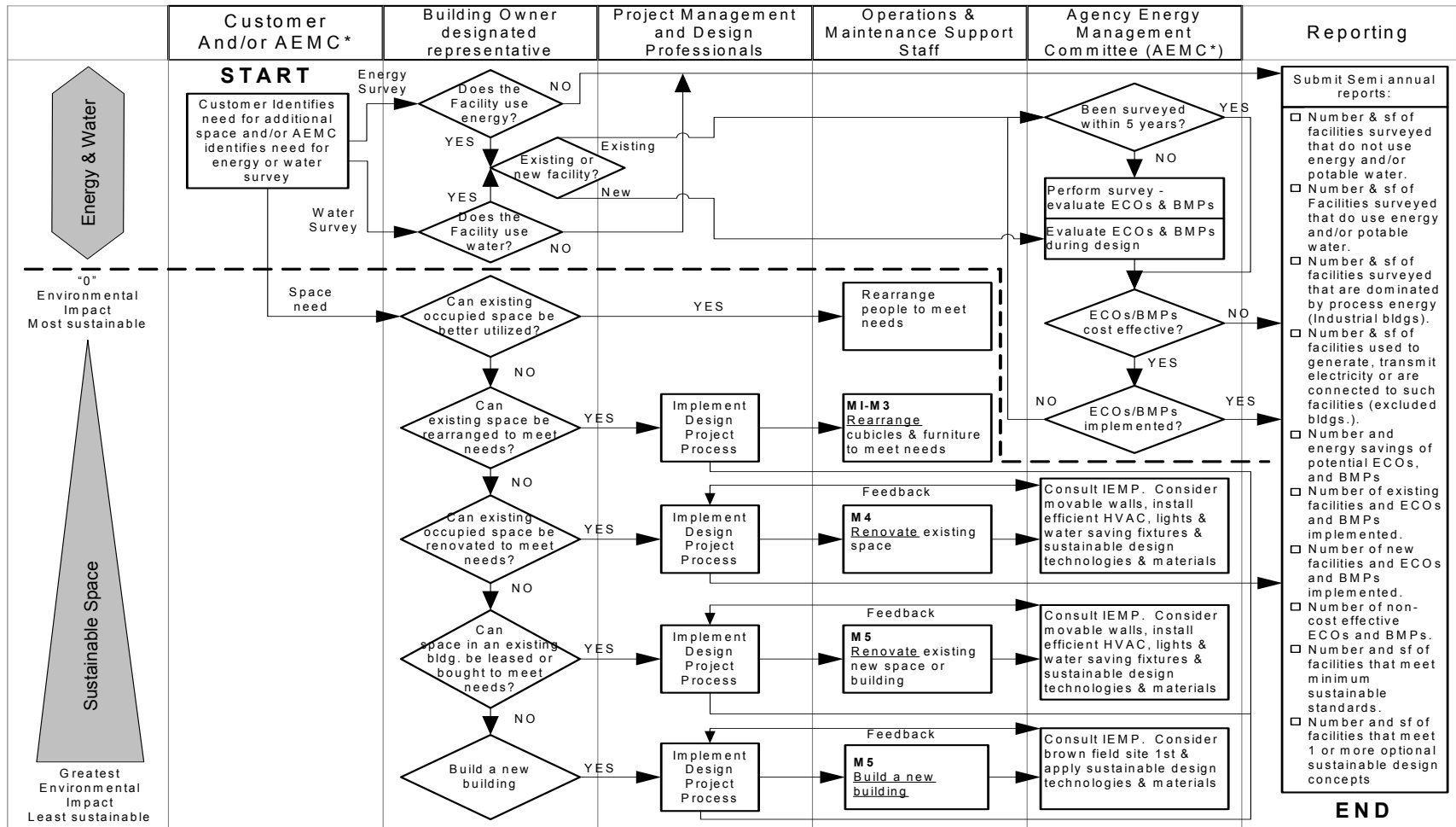
Water Survey – the inspection of all water-using equipment such as sinks, showers, tubs, toilets, irrigation and washing equipment, including water delivery and storage systems.

Water Conservation Best Management Practices (BMPs) – a variety of conservation technologies and techniques used to save water and associated energy costs.

Water Efficient Facility – buildings or structures which meet four or more of the Water Conservation Best Management Practices. Department of Energy.

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Energy, Water & Sustainable Space Flow Chart



*Consulting with IEMP should be occurring during the design and also during the renovation steps, because some features, if installed improperly, may provide no savings.